Otter Lake

Lapeer and Genesee Counties, T9,10N/R8,9E/ Sections 1,6,7,36
Flint River Watershed, Last surveyed 2014

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Environment

Otter Lake is a 68 acre lake located in the northwestern most corner of Lapeer County and the northeastern corner of Genesee County in the Village of Otter Lake (Figure 1). The lake lies within the boundaries of the Butternut Creek sub-watershed of the Flint River watershed. The origins of Butternut Creek flow into Powderhorn Lake which is located immediately north of Otter Lake. A navigable outlet flows from Powderhorn Lake into Otter Lake. Butternut Creek then exits Otter Lake on the south shore and flows to the mainstem Flint River.

The Village of Otter Lake has historical importance as being one of the primary lumber towns of Lapeer County. The area was noted for its vast stands of white pine and, at the time, warranted two railroads for product dispersal. The railroads used Otter Lake water to power their steam engines. Saw and grain mills were established on the shores of Otter Lake and lake ice was historically shipped to neighboring communities for refrigeration. As the logging era waned, the railroads closed and the Village of Otter Lake shifted from a commerce town to the residential community it is today. The Village supports a population of approximately 500 and Otter Lake is cherished as the community's most natural treasure.

The topography of the area surrounding Otter Lake is described as level to gently rolling hills to the south and moderately sloped high ground to the north and west. The U.S. Department of Agriculture Soil Survey indicates soils are composed of the Capac-Belding-Brookston soil association. Soils of this association are described as somewhat poorly drained with a sandy loam to clay loam subsoil. Land use of the area is predominantly for agriculture but the immediate shoreline of Otter Lake is used for recreation (park) and residential housing.

Otter Lake is oval in shape and has an estimated 2.1 miles of shoreline. The Village manages a park, campground, and swimming beach on the south shore which accounts for 11% of the shoreline. The northern half of the lake is lightly developed while the southern half is moderately developed with residential housing. In total, there are approximately 26 dwellings yielding a dwelling density of 12/mile. Most of the shoreline is in a natural state with only 13% being artificially armored. The Village maintains a small boat launch (fee required) on the south shore.

In general, Otter Lake is classified as a warmwater, small size, and deep lake of mesotrophic limnological characteristics. It is a uniquely clear and deep lake for its size reaching a maximum depth of 117 feet. Lake bottom contours are abrupt and two submerged islands are located near the lake center (Figure 2). Water chemistry characteristics measured in August, 2014 indicated a total alkalinity of 98 mg/l which is typical of the region. August measurements of secchi disk (16.0 ft.), total phosphorus (12.2 ug/l), and chlorophyll-a (2.37 ug/l) yielded a Trophic Status Index (TSI) of 39 on a scale of 0-100. A TSI of 39 is consistent with oligotrophic classification but near mesotrophic

classification. Lakes within this classification generally have intermediate nutrient levels, moderate water clarity, relatively abundant aquatic vegetation, and support diverse biological communities.

Temperature, oxygen, and pH profiles were conducted in August, 2014 (Table 1). These profiles were consistent with historical measurements and show summer thermocline development between 15-33 feet. Oxygen concentrations appear fish limiting (<3 mg/l) at depths greater than 63 feet. Thermal characteristics of the epilimnion and littoral zone are consistent with warmwater classification where summer temperatures approach the mid to upper 70's (F) for an extended period of time. Cool and cold water thermal habitat with sufficient oxygen is available between 18-63 feet.

The dominant type of fish habitat in Otter Lake is aquatic vegetation which is sparsely scattered throughout the littoral zone. Common vegetation observed in 2014 included thinleaf and broadleaf pondweed, curlyleaf pondweed, and water shield. Submerged wood structure (trees) was generally sparse.

History

Otter Lake has been monitored by Fisheries Division since 1962. Fish community surveys were conducted in 1962, 1977, 1981, 1987, 1990, 1995, and 1996. From 1968-1986, Otter Lake was managed by Fisheries Division as a two story trout lake. Splake and brown trout were routinely stocked. Trout stocking was discontinued in 1987 due to poor survival, few angler catch reports, and an increased population of northern pike. In 2005, the Village of Otter Lake stocked 1,000 yellow perch under a Fisheries Division approved private fish stocking permit. Also in 2005, a Department of Environmental Quality permit was issued for the placement of 4 log structures. These structures were mitigation for the anticipated removal of virgin timber believed to be submerged in the lake dating back to the logging era. To Fisheries Division's knowledge, no significant amount of virgin timber was ever found or removed.

Past surveys have consistently depicted a warm-cool water fish community in Otter Lake. Panfish, largemouth bass, bullhead species, and northern pike have consistently been prevalent. A total of 21 species of fish have been documented (Table 2). In general, Otter Lake has maintained a good reputation for recreational catches of bluegill, largemouth bass, and northern pike. The lake also serves the community for multi-purpose recreation including boating, swimming, and scuba diving.

Current Status

In June 2014, Fisheries Division conducted a fisheries survey of Otter Lake using trap nets, large-mesh and small-mesh fyke nets, gill nets, seine, and electrofishing gear. The use of multiple gear types helps to present a generalized picture of the fish community. Trap nets and large-mesh fyke nets are used to capture larger (>3 inches) fish species that inhabit the littoral zone or that move inshore at night. Gill nets sample fishes that occupy offshore waters and are particularly effective at capturing perch and northern pike. Seining and small-mesh fyke nets capture representative samples of small-bodied nongame species and smaller sizes (<3 inch) of sport fishes that inhabit the littoral zone. Night electrofishing samples all fish species that inhabit or move into the littoral zone and is particularly effective for sampling largemouth bass.

A total of 2,310 fish representing 17 species were collected in the 2014 fisheries survey (Table 3). Trap nets and large-mesh fyke nets accounted for 72% of the total catch. For the remaining catch, seine and small-mesh fyke nets accounted for 16%, electrofishing 11%, and gill nets 1%. Bluegill were the most abundant species collected comprising 78% of the total catch followed by pumpkinseed sunfish (10%), largemouth bass (3%), bullhead species (4%), and warmouth (2%).

A total of 1,797 bluegill averaging 5.0 inches were collected in the 2014 fisheries survey (Table 3). Seventy-five percent of the bluegill were collected with large-mesh fyke and trap nets. Small-mesh fyke nets accounted for 15% of the bluegill catch and electrofishing accounted for 8% of the catch. Average bluegill size of the large-mesh fyke net and trap net catch was 5.6 inches. Average bluegill size of the small-mesh fyke net catch was 2.6 inches and average size of the electrofishing catch was 4.8 inches. Thirty-two percent of the bluegill captured with large-mesh fyke and trap nets met or exceeded the acceptable harvest size of 6 inches. Bluegill size structure was dominated by fish in the 4-6 inch size range. Age and growth analysis indicated bluegill were growing below State average having a mean growth index of -1.3 (Table 4). Suppressed growth appeared within the first year and continued for all year classes. Nine year classes were represented and indicative of a self-sustaining population. Bluegill longevity appeared to peak at 8 years.

A total of 220 pumpkinseeds averaging 5.6 inches were collected in the 2014 fisheries survey (Table 3). Seventy-four percent of the pumpkinseeds were collected with large-mesh fyke and trap nets. Electrofishing accounted for 16% of the catch and seine and small-mesh fyke nets accounted for 10% of the catch. Average pumpkinseed size of the large-mesh fyke and trap net catch was 5.7 inches. Average pumpkinseed size of the electrofishing catch was 5.6 inches. Average size of the seine and small-mesh fyke net catch was 4.8 inches. Thirty-two percent of the large-mesh fyke net and trap net catch met or exceeded the acceptable harvest size of 6 inches. Pumpkinseed size structure was dominated by fish in the 4-6 inch size range. Age and growth analysis indicated pumpkinseeds were growing near State average having a mean growth index of -0.5 (Table 4). Five year classes were represented and indicative of a self-sustaining population. Pumpkinseed longevity appeared to peak at 6 years.

A total of 68 largemouth bass averaging 10.8 inches were collected in the 2014 fisheries survey (Table 3). Seventy-five percent of the largemouth bass were collected electrofishing and 22% were collected with large-mesh fyke and trap nets. Average largemouth bass size collected electrofishing was 11.0 inches and average size collected with large-mesh fyke and trap nets was 11.1 inches. Twenty-five percent of the largemouth bass catch met or exceeded the minimum harvest size of 14 inches. Largemouth bass size structure was widely distributed between inch groups ranging from 3-18 inches but the 9 inch size dominated in terms of abundance. Age and growth analysis indicated largemouth bass were growing below State average having a mean growth index of -3.1 (Table 4). Ten year classes were represented indicative of a self-sustaining population. Largemouth bass longevity appeared to peak at 8 years with some individuals living 10-11 years.

Northern pike were collected in relatively low abundance in the 2014 fisheries survey but represent an important sportfish and predator. A total of 13 northern pike averaging 20.5 inches were collected. Thirty-one percent of the northern pike met or exceeded the minimum harvest size of 24 inches. Too

few were collected for age and growth analysis but 4 year classes were represented indicating some level of natural reproduction.

All other sportfish collected in 2014 were captured in low abundance. Sixteen rock bass averaged 6.4 inches, eight channel catfish averaged 23.0 inches, seven yellow perch averaged 6.0 inches, and two black crappie averaged 6.0 inches. Non-game fish collected in appreciable numbers included 54 warmouth averaging 4.9 inches and 38 yellow bullhead averaging 8.9 inches.

Analysis and Discussion

In southern Michigan lakes, bluegill are one of the most abundant fish species present and play a key role in community structure and overall sportfishing quality (Schneider 1981). Schneider (1990) suggests indices of bluegill characteristics can be used to classify populations. The "Schneider Index" uses size scores of length frequency and relates them to an adjective ranking system ranging from "very poor" to "superior". Using the Schneider Index for classifying bluegill populations using trap or fyke net gear, Otter Lake scored 3.5 for an "acceptable/satisfactory" rank (Table 5). This ranking is similar to previous surveys indicating a fairly stable population.

Bluegill population dynamics have been studied extensively in southern Michigan lakes (Schneider 1981, 1990, 1993, Schneider and Lockwood 1997, Breck 1997). Many warmwater lakes in southern Michigan exhibit high bluegill recruitment and have low proportions of large (> 8 inches) bluegill. High recruitment of young bluegill results in over-abundance and suppressed growth due to competition for food and is referred to as a "stunted" population. A low proportion of large bluegill is typically related to mortality, either natural or by angler harvest. Otter Lake exhibits symptoms of a stunted bluegill population where there appears to be high recruitment and an abundance of 4-6 inch fish that are growing slow. However, bluegill longevity has also shown to be a key factor in determining size structure. Oftentimes, particularly in shallow eutrophic warmwater lakes, bluegill longevity rarely exceeds 6 years. Otter Lake's physical and limnological characteristics seem to favor for an extended life up to 8 years. As a result of living longer, a fair proportion of bluegill are able to reach 7 inches creating a reasonably good recreational fishery.

The pumpkinseed population of Otter Lake appears stable and relatively healthy. Compared to bluegill, pumpkinseed recruitment and abundance is considerably less resulting in average growth and a typical size structure for this area of the State. Pumpkinseed longevity appears to be the primary factor resulting in a low proportion of large (> 8 inches) fish. Few pumpkinseeds appear to live beyond 6 years and are able to achieve lengths greater than 7 inches.

Largemouth bass are a dominant predator in Otter Lake. The results of the 2014 fisheries survey indicated a stable and self-sustaining population. In terms of electrofishing catch per effort (CPE), Otter Lake was above the mean compared to other local lakes in terms of numbers/hour (102) and pounds/hour (93) (Figure 3 & 4). The above average biomass (pounds/hour) CPE is reflective of a presence of larger fish and speaks to a very good recreational fishery.

The relatively few northern pike captured in the 2014 survey is not necessarily reflective of their true population. The seasonal timing of the survey (June) is not considered optimal for northern pike capture due to reduced gear vulnerability. A detailed analysis of the population cannot be made based

upon the few specimens collected. However, 2014 survey data seems to indicate a viable and self-sustaining population exists and supports a good fishery.

Management Direction

Overall, the fish community and recreational fishery of Otter Lake appears to be satisfactory with ample opportunity to catch bluegill, pumpkinseed, largemouth bass, and northern pike. The lakes physical characteristics (high clarity, abrupt contours) ultimately challenges anglers in their quest for catching fish but good populations of these important sportfish are available.

Representatives of the Village of Otter Lake have enthusiastically approached Fisheries Division with a desire to stock walleye in an effort to create an additional recreational fishery. The village feels walleye would draw additional anglers to the lake to utilize their campground and boost the local economy. In review of the data collected in 2014, sufficient coolwater habitat required for walleye is available. The forage base is a concern as walleye will likely have to rely heavily upon centrachids (e.g. bluegill, bass) for their diet. If walleye can survive, they have potential to help control, through predation, an abundant bluegill population. Walleye would not be expected to reproduce and the fishery would remain dependent upon stocking. Management recommendations are to proceed with an experimental walleye stocking program in Otter Lake following Fisheries Division guidelines. Recommendations are to stock 5,100 spring fingerling walleye (75/acre) for three consecutive years and then switch to an alternate year schedule. Walleye would be stocked in 2015, 2016, 2017, and 2019. An evaluation of the stocking effort should be scheduled for 2020.

References

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Schneider, J.C. and R.N. Lockwood, 1997. Experimental management of stunted bluegill lakes. Michigan Department of Natural Resources, Fisheries Research Report 2040, Ann Arbor, Michigan.

Breck, J.E., 1997. Hurry up and wait: growth of young bluegills in ponds and in simulations with an individual-based model. Michigan Department of Natural Resources, Fisheries Research Report 1995, Ann Arbor, Michigan.

Figure 1. Location of Otter Lake, Lapeer and Genesee counties.

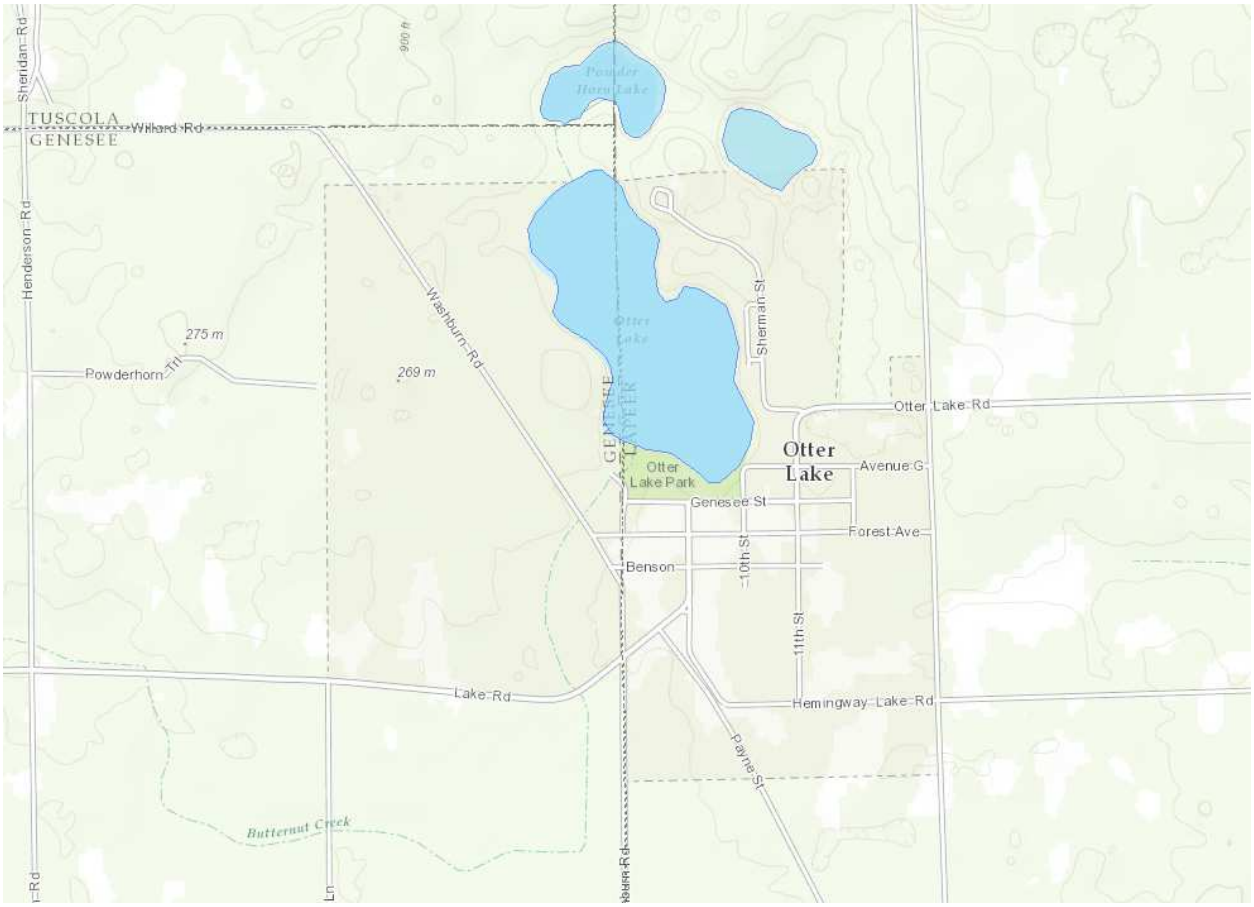
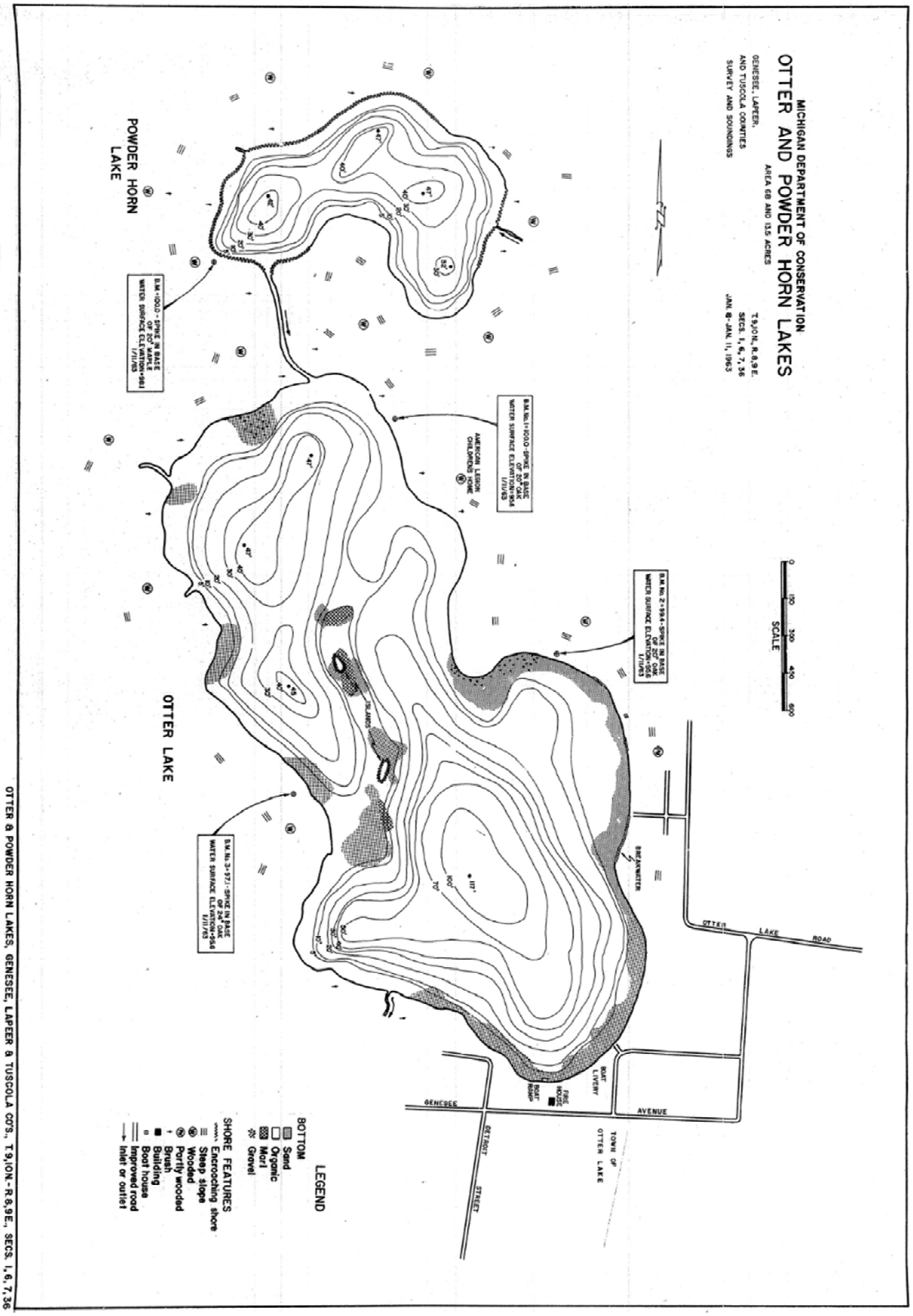
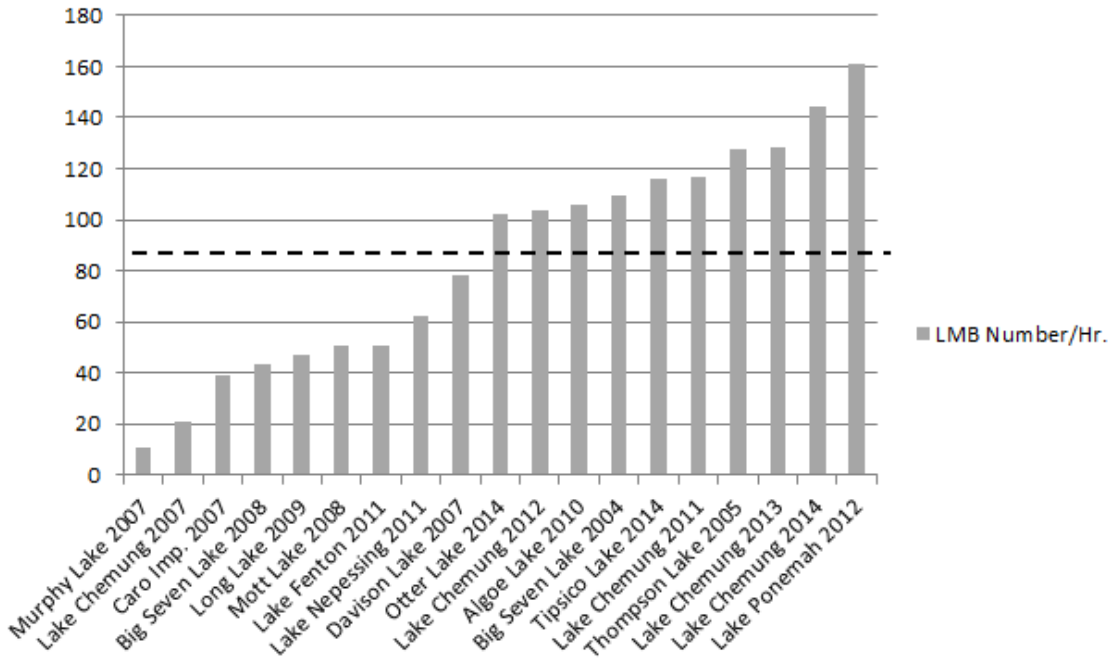


Figure 2. Hydrographic map of Otter Lake, Lapeer and Genesee counties.



OTTER & POWDER HORN LAKES, GENESEE, LAPEER & TUSCOLA CO'S., T9,10N-R.8,9E., SECS. 1,6,7,36

Figure 3. Night electrofishing catch per effort (number/hour) of largemouth bass for select lakes in Southern Michigan. (dashed line = mean value)



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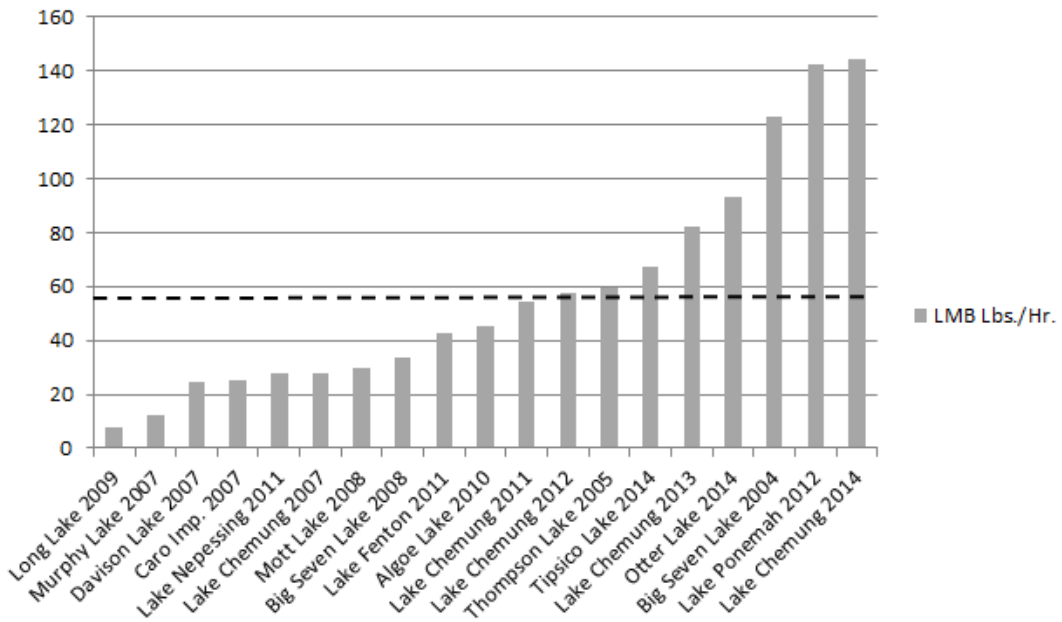

Table 1. Temperature, oxygen, and pH measurements for Otter Lake, Lapeer County. Measurements taken August 15, 2014. Shaded area indicates thermocline.

Depth (ft.)	Temperature (F)	Oxygen (ppm)	pH
0	72	10.5	7.9
3	72	10.0	7.9
6	72	9.9	7.9
9	72	9.9	7.9
12	72	9.6	7.9
15	72	9.7	7.9
18	65	9.8	7.9
21	58	9.8	7.7
24	55	10.2	7.7
27	49	10.1	7.6
30	49	9.5	7.6
33	45	7.9	7.4
36	44	7.0	7.4
39	43	6.3	7.3
42	42	5.7	7.3
45	41	4.6	7.2
48	41	4.1	7.2
51	41	3.7	7.2
54	41	3.5	7.2
57	40	3.3	7.1
60	40	3.2	7.1
63	40	2.9	7.1
66	40	2.8	7.0
69	40	2.2	7.0
72	40	1.7	7.0
75	40	1.3	7.0
78	40	1.2	7.0
81	40	1.0	7.0
84	40	0.9	7.0
87	40	0.8	6.9
90	40	0.8	6.9
93	40	0.7	6.9
96	40	0.7	6.9
99	40	0.7	6.9
102	40	0.7	6.9
105	40	0.6	6.9

Table 2. List of fishes in Otter Lake, Lapeer County. Origin: N= native, C= colonized, Status: P= recent observations.

Common name	Scientific name	Origin	Status
Carps and minnows			
Blackchin shiner	*Notropis heterodon*	N	P
Common carp	*Cyprinus carpio*	C	P
Golden shiner	*Notemigonus crysoleucas*	N	P
Mudminnows			
Central mudminnow	*Umbra limi*	N	P
Catfishes			
Channel catfish	*Ictalarus punctatus*	N	P
Suckers			
Lake chubsucker	*Erimyzon sucetta*	N	P
White sucker	*Catostomus commersoni*	N	P
Bullhead catfishes			
Black bullhead	*Ameiurus melas*	N	P
Brown bullhead	*Ameiurus nebulosus*	N	P
Tadpole madtom	*Noturus gyrinus*	N	P
Yellow bullhead	*Ameiurus natalis*	N	P
Pikes			
Grass pickerel	*Esox americanus*	N	P
Northern pike	*Esox lucius*	N	P
Sunfishes			
Black crappie	*Pomoxis nigromaculatus*	N	P
Bluegill	*Lepomis macrochirus*	N	P
Green sunfish	*Lepomis cyanellus*	N	P
Largemouth bass	*Micropterus salmoides*	N	P
Pumpkinseed	*Lepomis gibbosus*	N	P
Rock bass	*Ambloplites rupestris*	N	P
Warmouth	*Lepomis gulosus*	N	P
Perches			
Yellow perch	*Perca flavescens*	N	P

Table 3. Total catch (all gear) from Otter Lake, Lapeer County. Data collected June 2014.

Common name	Number	Percent by number	Weight (lbs.)	Percent by weight	Length range (in.)*	Average length (in.)	Percent legal size**
Black bullhead	3	<1	1.6	<1	8-11	10.2	100
Black crappie	2	<1	0.3	<1	4-7	6.0	50
Bluegill	1797	78	195.6	49	1-8	5.0	26
Brown bullhead	42	2	21.4	5	6-13	10.0	95
Central mudminnow	2	<1	-	<1	2-3	3.0	-
Channel catfish	8	<1	34.4	9	18-28	23.0	100
Grass pickerel	5	<1	0.1	<1	5-8	7.3	-
Green sunfish	16	<1	0.3	<1	2-4	2.9	-
Hybrid sunfish	15	<1	0.7	<1	2-6	3.7	7
Lake chubsucker	2	<1	0.7	<1	8	8.5	-
Largemouth bass	68	3	60.6	15	3-18	10.8	25
Northern pike	13	<1	27.0	7	12-26	20.5	31
Pumpkinseed	220	10	33.4	8	2-7	5.6	30
Rock bass	16	<1	3.5	<1	3-8	6.4	75
Tadpole madtom	1	<1	-	<1	3	3.5	-
Warmouth	54	2	5.6	1	1-8	4.9	-
Yellow bullhead	38	2	13.6	3	5-11	8.9	95
Yellow perch	7	<1	0.1	<1	5-7	6.1	14
All species total	2310		399.7				

* Note some fish may be measured to 0.1 inch, others to inch group.
** Percent legal or acceptable size for angling.

Table 4. Age and growth data from selected sportfish, Otter Lake, Lapeer County. Data collected June 2014.

Species/Age	No. aged	Length range (in.)	State avg. length (in.)	Weighted mean length (in.)	Weighted age frequency (%)	Mean growth index*
Bluegill						-1.3
Age I	11	1.3-1.9	2.4	1.53	17.74	
Age II	11	2.0-2.9	4.2	2.52	17.74	
Age III	10	3.0-3.8	5.3	3.31	12.40	
Age IV	17	3.8-5.1	6.2	4.39	20.72	
Age V	3	4.8-5.2	6.9	5.13	0.65	
Age VI	14	5.4-7.1	7.4	5.91	12.41	
Age VII	15	5.9-8.4	8.0	7.01	10.34	
Age VIII	10	7.1-8.7	8.4	7.88	7.70	
Age IX	2	7.7-8.8	8.7	8.28	0.31	
Largemouth bass						-3.1
Age I	1	2.2-2.2	5.4	2.20	3.17	
Age II	6	4.1-7.4	8.7	5.37	12.52	
Age III	8	5.8-8.7	10.6	7.71	13.36	
Age IV	5	7.6-9.4	12.0	8.17	4.89	
Age V	9	9.1-13.5	13.7	11.26	9.92	
Age VI	15	9.2-14.2	15.0	10.64	23.81	
Age VII	11	10.5-16.9	16.7	14.86	20.66	
Age VIII	6	9.8-17.3	17.6	14.59	4.54	
Age X	2	17.3-17.4	19.3	17.35	3.17	
Age XI	2	17.0-18.1		17.88	3.96	
Pumpkinseed						-0.5
Age II	10	2.5-3.4	4.2	2.97	30.40	
Age III	8	3.5-4.8	5.2	4.2	12.69	
Age IV	16	3.8-6.1	5.8	5.25	29.82	
Age V	12	4.7-7.9	6.3	6.47	19.89	
Age VI	5	6.1-7.1	6.8	6.71	7.20	

*****Mean growth index is the average deviation from the state average length at age and requires a minimum of 5 samples in an age group.

Table 5. Otter Lake bluegill classification using the Schneider Index (Schneider 1990). Size score is given in parenthesis.

Sample date	6/16/87	7/10/90	6/14/95	6/2/14
Sample size	742	908	305	1354
Average length (inches)	5.8 (3)	5.7 (3)	5.4 (2)	5.6 (3)
% ≥ 6 inches	39 (3)	34 (3)	23 (2)	32 (3)
% ≥ 7 inches	9 (3)	12 (4)	4 (2)	10 (4)
% ≥ 8 inches	0 (2)	0.1 (4)	0.9 (4)	0.8 (4)
Schneider Index	2.75	3.5	2.5	3.5
Rank[1]	Poor/Acceptable	Acceptable	Poor/Acceptable	Acceptable/Satisfactory

[1]Rank: 1 = Very poor, 2 = Poor, 3 = Acceptable, 4 = Satisfactory, 5 = Good, 6 = Excellent, 7 = Superior